## CLAIMS

1. Method for packaging a semiconductor die characterized in that it comprises the steps of:

attaching a surface of a semiconductor die (20) to a surface of a die carrier (32) having external lead bonds or terminals (36, 74), such that this die carrier does not extend in front of one or more sensors (22) provided on the top surface of the semiconductor die and one or more bond pads (24) on the top surface of the semiconductor die are coupled to one or more of the bond pads of said die carrier in an annular interface area (40) formed between the top surface of the semiconductor die and a surface of said die carrier;

encapsulating said interface area (40) with a sealing ring (44, 96); and

encapsulating the bottom surface of the die carrier and a bottom surface of the semiconductor die with a packaging material (48).

2. Method according to claim 1 characterized in that it comprises the steps of:

attaching a top surface of a semiconductor die (20) to a bottom surface of a die carrier (32) such that one or more sensors within the top surface of the semiconductor die are disposed below a first opening (34) in the die carrier that is larger than the one or more sensors but smaller than the semiconductor die and an interface area (40) is formed between said die and said die carrier where the top surface of the semiconductor die extends beyond the first opening in the die carrier and one or more bond pads on the top surface of the semiconductor die are coupled to one or more of the exterior terminals on the bottom surface of the die carrier;

curing the semiconductor die attached to the die carrier;

encapsulating the interface area (40) with a sealing ring (44);

curing the sealing ring;

encapsulating the bottom surface of the die carrier and a bottom surface of the semiconductor die with a packaging material (48); and

curing the packaging material.

3. Method according to claim 2 characterized in that it comprises the steps of:

encapsulating an exterior portion of the interface area with a first sealing ring (44);

curing the first sealing ring;

encapsulating the bottom surface of the die carrier and a bottom surface of the semiconductor die with a packaging material (48);

curing the packaging material;

encapsulating an interior portion of the interface area with a second sealing ring (46); and

curing the second sealing ring.

4. Method according to claim 1 characterized in that it comprises the steps of:

attaching a bottom surface of a semiconductor die (20) to a top surface of a recessed area (82) of a pre-printed frame, the recessed area being larger than the semiconductor die, the semiconductor die having one or more bond pads on a top surface for providing terminals to one or more sensors within the top surface, and the pre-printed frame having one or more wire leads;

curing the semiconductor die attached to the pre-printed frame;

forming a dam (86) to surround the recessed area to prevent a packaging material (48) from entering the recessed area;

curing the dam;

forming wire bonds (88) to couple each bond pad to

a portion of one of the wire leads that is near the recessed area;

encapsulating the wire bonds with a sealing ring (96);

curing the sealing material;

encapsulating the bottom surface of the pre-printed frame with the packaging material (48); and

curing the packaging material.

5. Method according to any of the above claims characterized in that it further comprises the step of applying a protective coating (38) over the one or more sensors of the semiconductor.

6. Method according to any of the above claims characterized in that it further comprises:

attaching a cap (68, 90) having a second opening larger than the sensors of the semiconductor die, the cap being attached to the top surface of the die carrier; and

substantially encapsulating the cap with the packaging material.

7. Semiconductor die package characterized in that it comprises:

a semiconductor die (20) having one or more bond pads on a top surface for providing terminals to one or more sensors (22), in particular optical sensors, within the top surface;

a die carrier (32) which does not extend in front of said sensors and which has one or more bond pads comprising bond terminals and having external lead bonds, the bond pads of said die carrier and the bond pads of said die determining between them an annular interface area (40) and being coupled in this area;

a sealing ring (44, 96) encapsulating said interface area (40); and

a packaging material (48) encapsulating the bottom surface of the die carrier and a bottom surface of the

semiconductor die.

8. Package according to claim 7 characterized in that it comprises:

a die carrier (32) having a first opening (34) larger than the one or more sensors but smaller than the semiconductor die and one or more external terminals; the top surface of the semiconductor die attached to the bottom surface of the die carrier such that the one or more sensors are disposed below the first opening and an interface area (40) is formed where the top surface of the semiconductor die extends beyond the first opening in the die carrier and each bond pad is coupled to a portion of one of the external terminals that is exposed on the bottom surface of the die carrier;

a sealing ring (44) encapsulating the interface area (40);

a packaging material (48) encapsulating the bottom surface of the die carrier and a bottom surface of the semiconductor die.

9. Package according to claim 8 characterized in that the sealing ring comprises a first external sealing ring (44) and a second internal sealing ring (46).

10. Package according to either of claims 8 and 9 characterized in that each bond pad is coupled to one of the external pads on the bottom surface of the die carrier by a solder bump (42).

11. Package according to any of claims 8 to 10 characterized in that the die carrier comprises a substrate and each external terminal comprises a bond pad (36) formed on a top surface of the substrate.

12. Package according to any of claims 7 to 10 characterized on that the die carrier has a pre-printed frame (60) and each external terminal comprises a wire lead (74).

13. Package according to claim 7 characterized in

that it comprises:

a pre-printed frame (80) having a recessed area (82) which is larger than the semiconductor die and one or more wire leads, a bottom surface of the semiconductor die being attached to a top surface of the recessed area of the pre-printed frame;

a wire bond (88) coupling each bond pad to a portion of one of the external terminals near the recessed area;

a dam (86) surrounding the recessed area to prevent packaging material (48) from entering the recessed area;

a sealing material (96) encapsulating each wire bond; and

a package material (48) encapsulating the bottom surface of the pre-printed frame.

14. Package according to either of claims 12 and 13 characterized in that it further comprises a cap (68, 90) having a second opening similar in size to the first opening, the cap being attached to the top surface of the pre-printed wire frame and the packaging material substantially encapsulating said cap.

15. Package according to any of claims 8 to 14 characterized in that said sealing ring and/or said packaging material comprise a thixotropic epoxy-based material.

16. Package according to any of claims 8 to 15 characterized in that the one or more sensors are covered with a protective layer (38).

17. Package according to any of claims 8 to 16 characterized in that it furthermore comprises a transparent encapsulation material in the first opening and on the top surface of the semiconductor die.

18. Package according to any of claims 8 to 17 characterized in that it furthermore comprises a lens disposed above the one or more sensors.

19. Package according to claim 14 characterized in that the cover is attached to the pre-printed frame by a polymide adhesive.

Add A7